

## CLAIMS

What is claimed is:

1. A sensor for detecting the presence of an analyte in a solution, comprising:
  - a photonic crystal;
  - a light source capable of illuminating the crystal with a light beam having a predetermined wavelength and direction; and
  - a position sensing detector positioned so as to detect the position of the light beam after it is transmitted by the crystal.
2. The sensor according to claim 1 wherein said photonic crystal comprises a porous polymer prepared by polymerization of one or more polymerizable components around a colloidal template followed by the selective removal of said colloidal template.
3. The sensor according to claim 2 wherein said colloidal template is an ordered, monodisperse colloidal template and said porous polymer is an ordered, monodisperse macroporous polymer.
4. The sensor according to claim 3 wherein said ordered, monodisperse macroporous polymer comprises a material selected from the group consisting of poly(methyl methacrylate) and polystyrene.
5. The sensor according to claim 1 wherein said photonic crystal is selected and said light source is selected and positioned so as to create cause a displacement of said light beam of at least  $2\text{ }\mu\text{m}$  when the refractive index of said photonic crystal changes by 0.002.
6. The sensor according to claim 1 wherein said photonic crystal is selected and said light source is selected and positioned so as to create cause a displacement of said light beam of at least  $4\text{ }\mu\text{m}$  when the refractive index of said photonic crystal changes by 0.002.

7. A kit capable of being assembled to provide a sensor for detecting the presence of an analyte in a solution, comprising:
  - a photonic crystal or kit for making a photonic crystal;
  - a light source capable of illuminating the crystal with a light beam having a predetermined wavelength and direction; and
  - a position sensing detector capable of being positioned so as to detect the position of a light beam from the light source after it is transmitted by the crystal.
8. The kit according to claim 7 wherein said photonic crystal comprises a porous polymer prepared by polymerization of one or more polymerizable components around a colloidal template followed by the selective removal of said colloidal template.
9. The kit according to claim 7 wherein said colloidal template is an ordered, monodisperse colloidal template and said porous polymer is an ordered, monodisperse macroporous polymer.
10. The kit according to claim 9 wherein said ordered, monodisperse macroporous polymer comprises a material selected from the group consisting of poly(methyl methacrylate) and polystyrene.
11. A method for sensing, comprising the steps of:
  - a) providing a sensor comprising at least one photonic crystal, at least one light source capable of illuminating the crystal with a light beam having a predetermined wavelength and direction, and at least one position sensing detector positioned so as to detect the position of said light beam after it is transmitted by the crystal;
  - b) saturating the crystal with a liquid so as to produce a saturated crystal having a first refractive index;
  - c) calculating for the photonic crystal a dispersion surface and using the dispersion surface to calculate a effective incident light vector; and
  - c) illuminating the saturated crystal with at least one light beam, the beam being incident along substantially the calculated effective incident light vector such that if the

saturated crystal is modified to have a second refractive index, the position-sensing detector will detect a change in position of the transmitted light beam.

12. The method according to claim 11, further including the step of selecting the light beam to have a predetermined wavelength.
13. The method according to claim 11 wherein step c) includes calculating the propagation direction inside the crystal for at least one incident light ray.
14. The method according to claim 11, wherein step a) includes providing an array of light sources, each light source having an associated position-sensing detector, and at least one photonic crystal positioned between said light sources and said associated position-sensing detectors.